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UNIVERSITY OF KANSAS  
ERTS DETAILED IMAGE INTERPRETATION REPORT

CRINC  
DIIR No. 2264-4  
Date  
Prepared 31 Jan 73

Subject: Discrimination of winter wheat on irrigated land in southern Finney County, Kansas.

Subject Geographic Coordinates 37-55N/101-00W NASA Test Site No. 76  
NASA Image Descriptors: Wheat, irrigation, agriculture

Report Summary:

Winter wheat in the large field irrigated landscape of southern Finney County, Kansas was successfully discriminated by use of 4 ERTS-1 images. These images were acquired 16 August 1972, 21 September 1972, and 2 December 1972. MSS-5 images from each date and the MSS-7 image from 2 December 1972 were used. Human interpretation of the four images resulted in a classification scheme which produced 98% correct estimation of the number of wheat fields in the "training" sample and 100% correct estimation in the "test" sample. Overall correct separation of wheat from non-wheat fields was 93% and 86%, respectively. Offsetting errors resulted in the estimation accuracy for wheat.

Imagery References

CRINC Image No.	NASA Image ID Block	Subject Image X	Coordinates Y	Cloud Cover	Image Quality
MP00330	E-1024-16511-5	(9.5) 30	80	0	Excellent
MP00164	E-1060-16512-5	(9.5) 20	42	50	Fair
MP00476	E-1132-16521-5	(9.5) 30	40	0	Fair
MP00480	E-1132-16521-7	(9.5) 31	39	0	Good

Map References:

USGS NJ14-4, NJ14-7, Scale 1:250,000

Digital Data Used Yes No x

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Unclas  
G3/13 00475

(E/3-10475) DISCRIMINATION OF WINTER  
WHEAT ON IRRIGATED LAND IN SOUTHERN  
FINNEY COUNTY, KANSAS (Kansas Univ./Center  
for Research, Inc.) 5 p HC \$3.00

## REPORT

This report summarizes human interpretations conducted to date to discriminate winter wheat fields on ERTS-1 imagery. For purposes of the initial experiment, the study area was restricted to irrigated land in southern Finney County, Kansas. Both multispectral and temporal image inputs were employed.

Data were taken from the imagery for two test areas for which ground truth was available. One test area was used to devise the classification. The second area was reserved for testing the classification scheme.

Each field was interpreted from each MSS image by assigning the field to one of five gray levels. The gray levels were established by consensus of these image interpreters after viewing the gray levels in the image and dividing the gray scale tablet at the bottom of each image into five distinct levels. A consistent division was used for all images. All images were 9.5" film positives. Four images were initially interpreted; MSS-5 (16 August 72), MSS-5 (21 September 72), and MSS-5 and -7 (2 December 1972).

The initial interpretation attempted to use two spectral bands on one date for discrimination. MSS-5 and 7 images acquired 2 December 1972 were used. This data set (2 images) was used because wheat, the only living vegetation in the landscape, should have imaged differently from the other landscape components (crops and bare soil). However, less discrimination than was anticipated occurred (Figure 1). Although 78 percent of all fields were correctly classified into the categories wheat and not wheat, the estimated number of wheat fields (28) was only 58 percent of the actual number (48).

In an attempt to increase discrimination (reduce error), additional images were added to the data set. The MSS-5 images for 16 August 72, and 21 September 72, were interpreted in the same manner as the December images.<sup>1</sup> A four way decision matrix (Figure 2) was constructed from the expanded data set. This interpretation yielded 93 percent accurate separation of wheat from non-wheat. The estimated number of wheat fields (47) was 98 percent of the actual number (48).

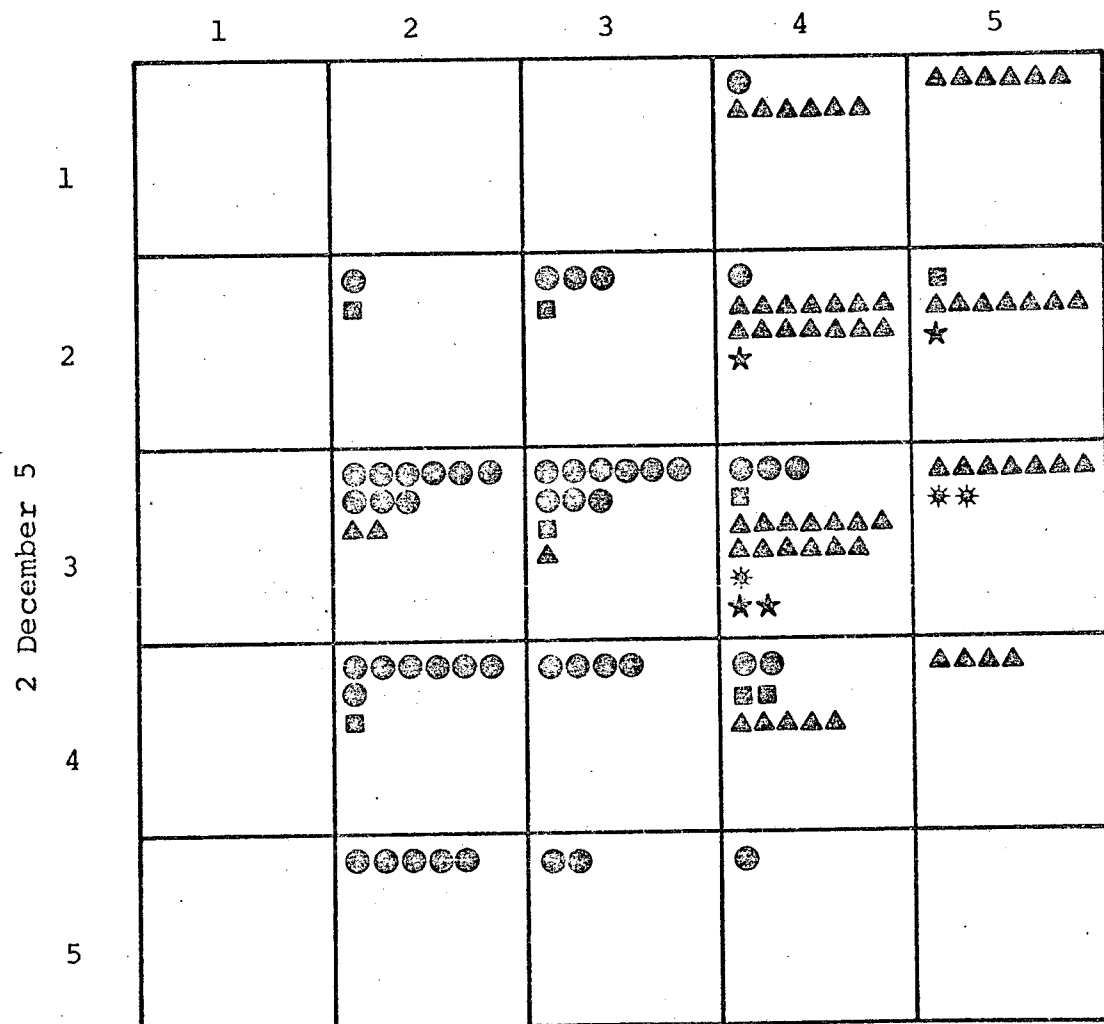
The decision boundary was applied to the second data set from southern Finney County. 86 percent of all fields were correctly classified. Offsetting errors resulted in 100 percent correct estimation of the number of wheat fields (14).

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<sup>1</sup>All imagery acquired between 22 September and 1 December over Finney County was cloud covered.

The interpretations reported above verify that under appropriate environmental conditions (in this case, large field irrigation), human interpreters can discriminate winter wheat from other crops or cropping conditions in the agricultural landscape with high levels of accuracy.

21 September 5



● Wheat, planted and volunteer   ■ Wheat stubble, including weeds  
 ▲ Feed Grains   \* Alfalfa   ★ Pasture

Figure 1. Tonal assignments of fields in the "training" set. Each field is plotted at the intersection of its tones on two images. Separation along the heavy line results in 78 percent correct separation of wheat from non-wheat but only 48 percent correct estimation of wheat.

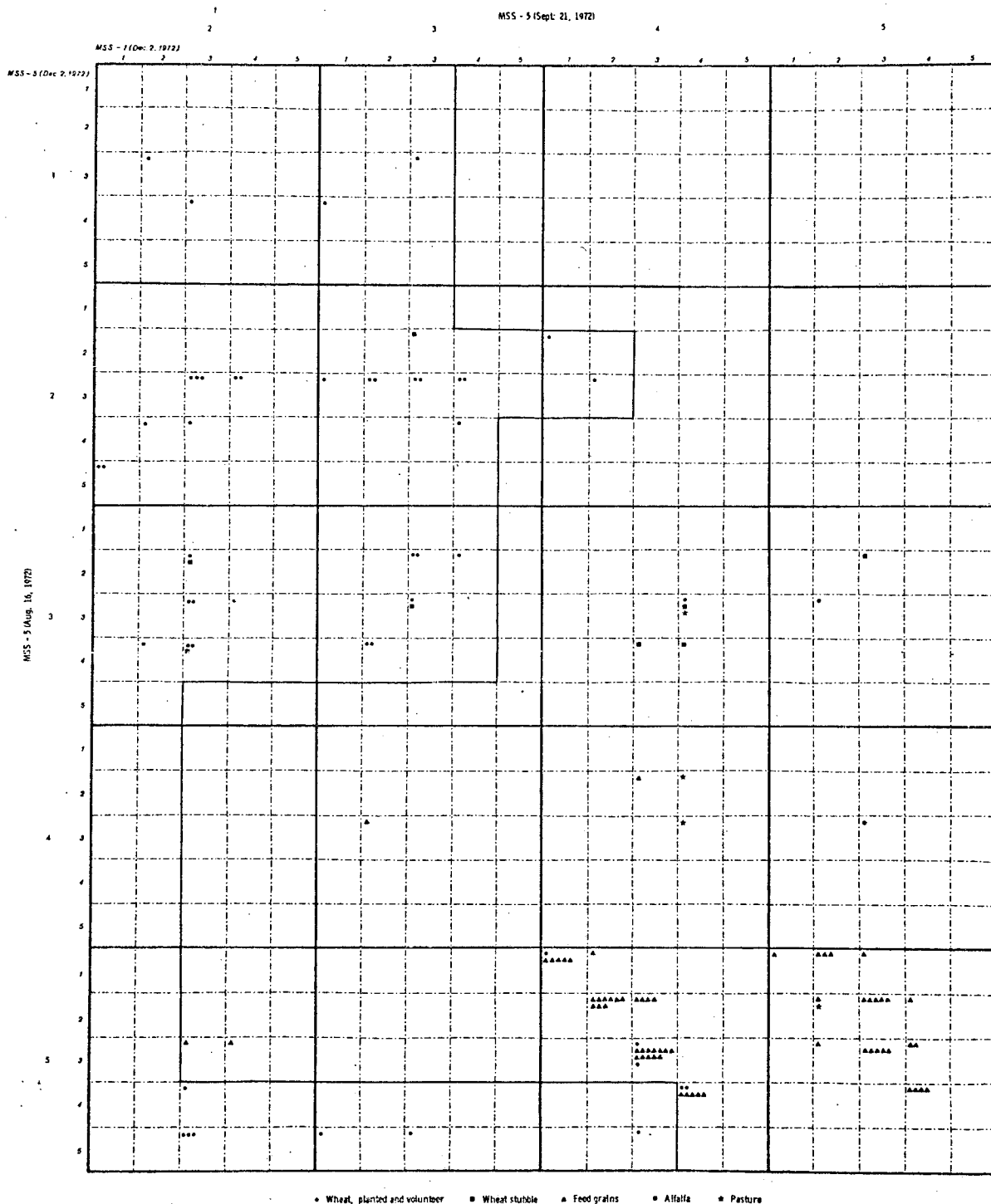


Figure 2. Tonal assignments of fields in the "training" set. Each field is plotted at the intersection of its tones on four images. The tone levels for the December images are indicated in italics and are repeated within each major block. Separation along the irregular line results in 93 percent correct separation of wheat from non-wheat and 98 percent correct estimation of wheat.